

CLAIMS

What is claimed is:

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1. A method for making active nickel material for a positive electrode of a hydrogen storage battery comprising the steps of: forming active nickel material particles in the presence of an oxidizing agent.

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2. The method of claim 1 wherein the active nickel particles are successively grown in the presence of an oxidizing agent to partially oxidize some particles.

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3. The method of claim 1 wherein forming further includes: providing an active nickel material seed with a first degree of oxidation and growing a second active nickel material about the seed, the second active material about the seed having a second degree of oxidation.

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4. The method of claim 3 wherein the second degree of oxidation is 0% or about 0%.

5. The method of claim 1 wherein the particles are grown in an oxidizing solution to provide oxidized and non-oxidized active material throughout each particle.

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6. The method of claim 1 wherein the particles are grown by the formation and breakdown of a metal complex to form a precipitate.

7. The method of claim 1 wherein forming active nickel material particles includes:

30 combining a metal ion solution, ammonium solution, a metal hydroxide and an oxidant in a reactor to precipitate the active nickel material particles.

8. The method of claim 7 wherein the metal ion solution is a metal sulfate solution.

5 9. The method of claim 8 wherein the ammonium solution is ammonium hydroxide and the metal hydroxide is sodium hydroxide.

10 10. The method of claim 8 wherein the metal ion solution includes one or more feed streams formulated to produce active nickel material with a base metal composition consisting essentially of Ni-Co, Ni-Co-Zn, Ni-Co-Zn-Mg, Ni-Co-Zn-Mg-Ca, and Ni-Co-Zn-Mg-Ca-Cu.

15 11. The method of claim 1 wherein the active nickel material has a base metal composition consisting essentially of Ni-Co, Ni-Co-Zn, Ni-Co-Zn-Mg, Ni-Co-Zn-Mg-Ca, or Ni-Co-Zn-Mg-Ca-Cu.

12. The method of claim 1 wherein the active nickel material particles comprise nickel hydroxide material and nickel oxyhydroxide material.

20 13. The method of claim 1 wherein the active nickel material particles include particles that are substantially spherical.

25 14. The method of claim 1 wherein forming further includes adjusting process conditions to make the active nickel material with an apparent density of $1.4 - 1.7 \text{ g/cm}^3$, a tap density of about $1.8 - 2.3 \text{ g/cm}^3$ and an average size range of about $5-50 \mu$.

15. The method of claim 1 wherein the active nickel material is formed with cobalt hydroxide and cobalt oxyhydroxide.

30 16. The method of claim 1 wherein the active nickel material is oxidized more than 1%.

17. The method of claim 1 wherein the active nickel material is oxidized 3% to 70%.

35 18. The method of claim 1 wherein the active nickel material is provided with a surface that is less than 98% oxidized.

40 19. The method of claim 1 wherein the active nickel material is provided with a surface that is 5% to 75% non-oxidized and the remaining portion that is oxidized.